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Virus Diseases in Salto (Uruguay)

THE DEPARTAMENTO DEL SALTO, situated in the northwest part of the Republica Oriental del Uruguay, represents more than 35 per cent of the total area devoted to citriculture in the country, with about 7,000 hectares, 800 growers, and 1,300,000 trees. According to the last census, published in 1961, the distribution is as follows: mandarin (*Citrus reticulata* Blanco) varieties 54.5 per cent, sweet orange (*C. sinensis* Osbeck) varieties 29.7 per cent, and other varieties 15.8 per cent. In the last group, the summer orange Valencia Late is predominant. In recent years, in replantings and in new groves, the proportion of summer orange, Navel orange, and grapefruit (*C. paradisi* Macf.) has been increasing.

The first groves in Salto were planted with seedlings of sweet orange but later, with the extension of citrus culture, growers realized the importance of increasing yields with better varieties introduced as buds or as nursery plants from other countries. The new groves were budded on sweet orange rootstock. These plants were susceptible to brown rot gummosis (*Phytophthora parasitica* Dastur and *P. citrophthora* Sm. & Sm.) and, as disease started to kill them, the citrus growers began to graft onto sour orange (*C. aurantium* L.) when establishing new groves. This rootstock gave vigorous plants, which were not affected by gummosis, were highly productive, and produced fruit of good quality. On account of these favorable conditions, the use of sour orange rootstock spread rapidly throughout the country.

About 1940, tristeza appeared in our citrus groves. This disease destroyed all plants on sour orange rootstock in the entire country in about eight years. The problem of tristeza was solved by using trifoliate orange

[*Poncirus trifoliata* (L.) Raf.] as a rootstock. At present nearly all citrus groves consist of plants grafted on this rootstock, on which the commercial varieties produce well.

The damage caused by tristeza led us to experiment with new rootstocks. Trials were started more than ten years ago with Cleopatra mandarin (*C. reshni* Hort. ex Tanaka), Palestine sweet lime (*C. limettioides* Tanaka), trifoliate orange, and sweet orange. In more recent tests other rootstocks were included, such as rough lemon (*C. jambhiri* Lushington), Rangpur lime (*C. limonia* Osbeck), and Morton, Carrizo, Troyer, and Rusk citranges (*C. sinensis* x *P. trifoliata*). On all these rootstocks, the most important commercial varieties were used as buds. Some of the rootstocks are susceptible to one or another of the viruses that cause disease in citrus and therefore became diseased as a result of the presence of the virus in the scion bud, thus demonstrating the existence of certain viruses in the varieties used as scions.

In these various rootstock trials and in commercial groves, the most frequently observed virus diseases are the following:

Psorosis.—The symptoms of this disease are found in practically all varieties grown in the Salto area. It seems that in the last few years, the incidence of lesions on trunks and branches has increased, resulting in decreased vigor and decreased production of plants.

Bark lesions have been observed to begin to develop even on plants more than 25 years of age. From such old trees, regarded as sound in former years, buds have been taken and grafted. The daughter plants started to show bark lesions four or five years after grafting. Perhaps the increase in incidence of the disease and the more severe manifestation of symptoms are due to the indiscriminate selection of buds from young plants after the destruction of citrus groves by tristeza.

Exocortis.—This disease causes the most trouble in some varieties of commercial importance such as Thompson grapefruit and Washington Navel orange and perhaps is more evident in groves than other virus diseases. The sudden appearance of exocortis is no doubt explained by the fact that exocortis virus produces visible symptoms neither on sweet orange nor on sour orange and thus did not become evident until trifoliate orange began to be used as a rootstock; most of the mother trees used in the nurseries carried the virus of exocortis even before tristeza became a problem in the country.

In a trial started in 1955, buds from trees with symptoms of exocortis were grafted into trifoliate orange seedlings, and buds from healthy-

appearing trees were grafted into a second lot of trifoliate orange seedlings for comparison. The two lots of plants were planted alternately. At present, only the plants grafted with buds from diseased plants show typical symptoms consisting of stunting of growth and scaling of bark on the trunk of the trifoliate orange rootstock.

XYLOPOROSIS.—In the previously mentioned trials in which some plants were grafted into Persian lime, it has subsequently been possible to observe xyloporosis-like symptoms. After four or five years, some of the plants began to stop growing and producing fruit. With time, the symptoms increased in severity so that now all plants on this rootstock are affected, some seriously stunted and others dead. In many of these plants, it was possible to observe a pitting of the wood underneath the bark and gum pockets in the phloem below the graft union.

TRISTEZA.—The virus of tristeza is no doubt present in all trees of any age in the country because both the virus and its efficient vector are present here.

The solution to the problem of control of psorosis, exocortis, and xyloporosis seems to lie in the propagation of virus-free clones obtained from nucellar seedlings. Work along this line is presently under way.